

IV. REMARKS

The Examiner is thanked for extending the courtesy of a telephone interview on April 29, 2005 during which it was agreed that the Office Action of March 23, 2005 is not a Final Office Action.

It is noted that the ratio in claim 11 is dimensionless, and it impossible to recite any unit of measurement. Thus the objection to claim 11 should be withdrawn.

Claims 1-4, 6-12, 17 and 19-22 are rejected under 35 U.S.C. 102(b) as being anticipated by JP 9127894 (Takeuchi).

The Examiner based his judgement on the Derwent abstract of Takeuchi. Applicants have translated the entire citation into English, a copy thereof being attached to the amendment. The description of Takeuchi appears helpful in explaining the basic principles of volume holograms.

In the present invention, surface formation patterns having diffractive properties for coupling light out from the light pipe to provide backlighting of a flat panel display are provided as an integral part of a surface of the light pipe, i.e., are manufactures directly in the surface, see, e.g., the description page 11, lines 20 to 22. The diffraction gratings of the present invention are also known as surface relief gratings. To clarify, claims 1 and 17 have been amended to be even clearer in that the patterns included in the surface are surface formation patterns. The term "surface formation patterns" is supported, e.g., by originally filed dependent claims 2 and 5.

To further emphasize this distinction, new dependent claims 30 and 31 define that the surface formation patterns are

manufactured directly on the first surface. For support, see, e.g., the description page 11, lines 20 to 22.

Instead of disclosing or suggesting surface formation patterns included in a surface of a light pipe (i.e., a surface relief structure), Takeuchi discloses use of a volume phase reflection hologram, see, for example, paragraphs 0030 and 0039 of the translation. As mentioned by Takeuchi, a volume hologram 30 is affixed either to the back or front reflection plane.

It is essential to note that in volume holograms, diffractive properties are provided within the volume, i.e., in the material, of the hologram itself by recording the desired pattern in the hologram by means of optical means, for example, by exposing the hologram to ultraviolet rays, see, for example, paragraph 0031 of Takeuchi. A volume hologram does not have any surface formation pattern in the surface thereof. Instead, the diffractive properties are recorded optically within the volume thereof. Therefore any diffractive properties in Takeuchi are in the volume of the hologram affixed on the light pipe, and are not provided by means of a surface relief structure, i.e., surface formation patterns, included in a surface of a light pipe.

It is also noted that in Takeuchi, the diffractive element needs to be provided by affixing a separate element on the surface of the light pipe because it is not possible to manufacture holograms directly in any of the surfaces of a light pipe.

There is no disclosure or suggestion in Takeuchi that, instead of volume phase reflection holograms wherein modifications to the light are provided within the volume of the hologram, it could be possible to use surface relief patterns provided directly in the surface of the light pipe. Therefore it fails to disclose or suggest a first surface including patterns having diffractive properties for coupling light out from the light pipe to provide back lighting of a flat panel display. Because no surface relief patterns included in the surface of the light pipe are disclosed, Takeuchi cannot disclose surface relief patterns included in the surface and comprising uniform, mutually different areas, distributed over said first surface in the manner defined after the wherein clause.

Claims 1 and 17 thus include matter that is clearly not in Takeuchi. Hence the rejection of claims 1-4, 6-12, 17 and 19-22 under 35 U.S.C. 102 on Takeuchi should be withdrawn.

The skilled person understands that a hologram can only be produced in laboratory conditions, and that a mass production thereof is not an economically viable option because the holograms have to be produced one by one. Recording a hologram takes considerable time and requires relatively high precision from the recording process, and therefore it is not considered as being suitable technique for producing diffractive arrangements for mass produced electronic devices, for example, for mobile phones or laptop computers.

This problem is avoided in the present invention by producing the diffractive surface formation patterns

directly in the surface of the light pipe, for example, by means of moulding or extrusion, as explained on page 11, lines 20-28. As mentioned, the light pipe of the present invention is suitable for mass production, thus providing considerable advantage on Takeuchi.

Therefore the subject matter of claims 1 and 17 are unobvious over Takeuchi.

Claims 1-2, 8-9 and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Nishikawa (EP0821293A2).

However, it is essential to note that while the present invention is about using diffractive effects to couple light out from a light pipe within which the light is propagated, Nishikawa discloses a totally different principle of lighting. It can already be seen from the title that Nishikawa relates to reflection, not diffraction. In other words, whatever diffractive properties are involved in Nishikawa, these are always associated with reflecting light from a surface. Nishikawa does not disclose that the light would go into the material and diffracted when it is coupled out from the material. Instead of disclosing a structure for coupling light out from a light pipe, Nishikawa discloses modifying by reflection a light which has already been coupled out from a light pipe.

Similarly to Takeuchi, Nishikawa consistently refers to volume holograms, see, for example, column 4, line 37; column 6, lines 11 and 12; column 7, lines 18, 19, 22, 28-31 or 51-52; column 8, lines 1, 4, 16, 31-32 and 45-46, and in numerous other locations. As with Takeuchi, volume holograms do not equate with surface formation patterns

included directly into a surface of a light pipe for producing diffractive effects.

Furthermore, and similarly with Takeuchi, Nishikawa discloses use of a volume hologram that is affixed on the surface, and there is no disclosure or hint of diffractive surface formation patterns included in the surface of the light pipe. Figures 2, 4, 8, 9 and 11 of Nishikawa are consistent in disclosing the way the reflective diffuser plates are used therein. These figures are not to be confused with, for example, figures 1, 5 or 10 of Nishikawa, where light appears to propagate through the material of the reflective hologram attached on the surface of the light pipe, but the latter mentioned figures illustrate only how to record, i.e., how to manufacture by optical means an image in the volume of a hologram of the kind described by Nishikawa. When the holograms of Nishikawa are in use they are never used for anything else than reflectors as shown in figures 2, 4, 8, 9 and 11.

It is essential to understand the fundamental difference between the holograms of Nishikawa and surface relief structures of the present invention. In this citation the holograms are used to produce a picture with a three dimensional appearance, and not for coupling light out from a light pipe. A property of a picture is that there are lighter and darker parts, which are due to a different lighting coming from those parts to the eye. The disclosed holograms are not for providing back lighting of a flat panel display, but are elements that can be attached on a surface of a light pipe for providing desired pictures by letting different back lighting from the surface of the

light pipe through such that different images are formed. This is a further reason why Nishikawa simply cannot disclose surface formation patterns that are included in a surface of the light pipe and have diffractive properties for coupling light out from the light pipe to provide back lighting of a flat panel display.

Thus the rejection of claims 1-2, 8-9 and 17 under 35 U.S.C. 102 on Nishikawa should be withdrawn.

Further, since surface formation patterns are not suggested by Nishikawa, there claims are unobvious over it.

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi (JP9127894) or by Nishikawa (EP0821293A2)) over Janson et al. (figure 30).

Similarly, since Janson fails to disclose surface formation patterns, combining it with Takeuchi or Nishikawa does not result in the present invention. Thus the rejection of claim 30 should be withdrawn.

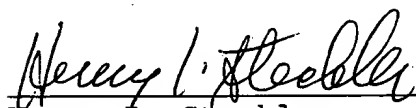
New claims 32, 33, 34 and 35 respectively correspond to allowable claims 5, 13, 14 and 15 in independent form and are therefore allowable.

For all of the foregoing reasons, it is respectfully submitted that all of the claims now present in the application are clearly novel and patentable over the prior art of record, and are in proper form for allowance. Accordingly, favorable reconsideration and allowance is respectfully requested. Should any unresolved issues

remain, the Examiner is invited to call Applicants' attorney at the telephone number indicated below.

The Commissioner is hereby authorized to charge payment for any fees associated with this communication or credit any over payment to Deposit Account No. 16-1350.

Respectfully submitted,


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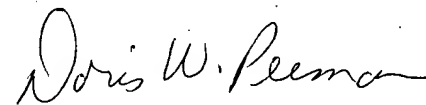
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